BREVIORA

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A PICRODONTID INSECTIVORE(?) FROM THE PALEOCENE OF WYOMING

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and

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Among the interesting materials found in the course of recent field work in early Tertiary deposits in Wyoming, conducted jointly by the University of Wyoming and the Museum of Comparative Zoology, are several fragments of maxillae and mandibles and a number of isolated teeth of a picrodontid. Only two other records of these problematical little mammals are known: *Picrodus silberlingi* Douglass 1908 from the Fort Union (Lebo) of Montana and *Zanycteris paleocena* Matthew 1917 from the Tiffany of Colorado, the former based on lower, the latter on upper teeth. We confidently assume that our upper and lower molars are referable to the same species. On the evidence of the upper molars this species cannot be placed in *Zanycteris* and on that of the lowers it cannot be excluded from *Picrodus*. We suspect it to be new, but the differences from, and the parts in common with, *P. silberlingi* are so few that we refrain for the present from any attempt at diagnosis. Gazin's tentative record of *Zanycteris* from the Shotgun member of the Fort Union formation in the Wind River Basin (1961, p. 51, and *in* Keefer, 1961) is almost surely based on this form.

The acknowledgments made in a previous paper (Patterson and McGrew, 1962) apply equally to this one, except that the photographs printed here were taken by Mr. John F. Cutler. Abbreviations are as follows: U.W., University of Wyoming; M.C.Z., Museum of Comparative Zoology.

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INSECTIVORA(?)

PICRODONTIDAE Simpson

PICRODUS Douglass

PICRODUS sp. cf. P. SILBERLINGI Douglass

Material: U.W. no. 1780, fragment of left maxilla with M^{1-2}, incomplete alveolus of M^3; M.C.Z. no. 8363, fragment of right maxilla with M^1, incomplete alveolus of M^2; U.W. no. 1781, four complete and three partial M_1; M.C.Z. no. 8422, three M_1; M.C.Z. no. 8423, M_2.

Horizon and localities: Paleocene, early Tiffanian. U.W. no. 1780 is from the Bison Basin Saddle locality, Fort Union formation, E½, sec. 28, T. 27 N., R. 95 W., Fremont Co., Wyoming (Bell, MS.; Gazin, 1956). All the other specimens are from the Shotgun local fauna, Shotgun member, Fort Union formation, ¾ mile SW of the more northerly of the Twin Buttes in the northern part of the Wind River Basin, NE ¼, SE ½, sec. 31, T. 6 N., R. 3 E., Fremont Co., Wyoming (Keefer, 1961; Patterson and McGrew, 1963).

All specimens were encountered in the course of washing operations.

DESCRIPTION

The upper molars of the Wyoming form agree with those of *Zanycteris paleocena* (Matthew, 1917; Simpson, 1935) in basic structure yet differ considerably in detail, especially as regards M^1. This tooth is nearly quadrangular, rather than triangular, in outline, an outpocketing of the posterior cingulum forming a postero-internal angle. The protocone is more anterior in position and more directly internal to the paracone. The protoloph, within which the protocone is completely subordinated, is a heavy, transversely aligned crest that extends almost to the internal base of the paracone, from which it is separated by a shallow notch. The anterior face of the tooth slopes gently upward; the anterior cingulum (double in U.W. no. 1780) is strong compared with that of *Zanycteris*. The antero-external corner of the tooth is rounded and bears no stylar projection. A faint, irregular crest extends, with interruptions, from the base of the protocone to the metacone. It is situated almost wholly within the central basin, of which the lingual and postero-lingual margins are formed by the cingulum. The enamel within

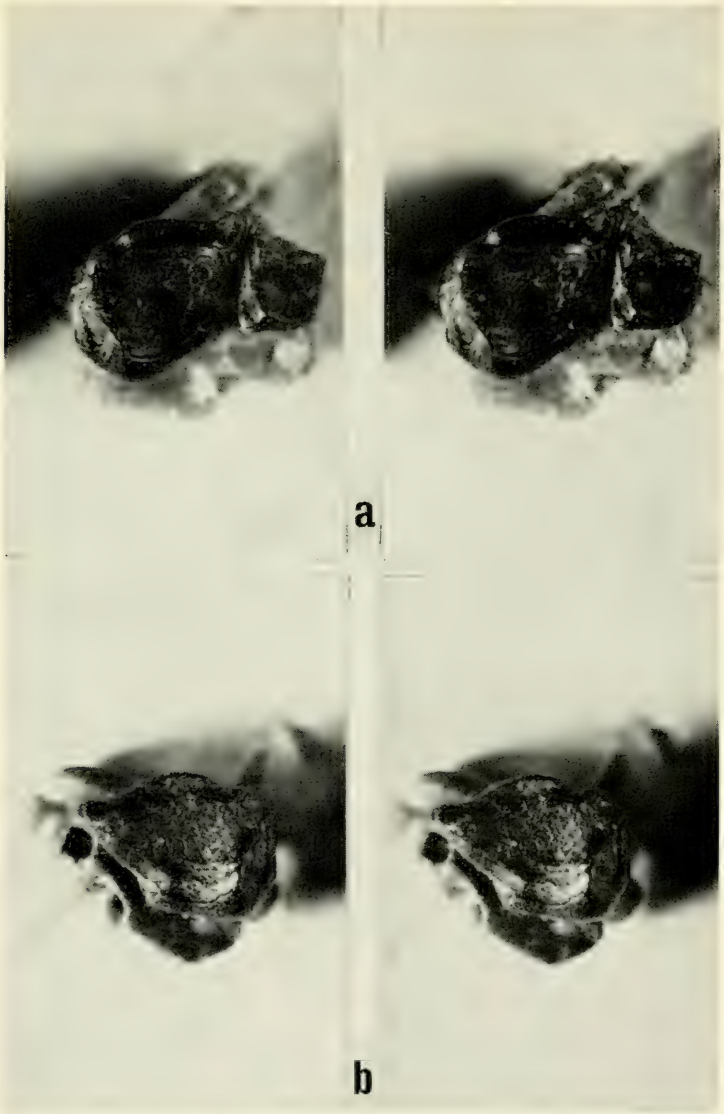

FIG. 1. *Picrodus* sp. cf. *P. silberlingi* Douglass. *a*, U.W. no. 1780, fragment of left maxilla with M^{1-2}. *b*, M.C.Z. no. 8363, fragment of right maxilla with M^1. Approximately X 8. Stereoscopic views.

the area enclosed by the cingulum and the aforementioned low crest is fully as wrinkled as that over the main portion of the central basin. *Picrodus* sp. is rather more advanced than *Z. paleocena* in the essentially complete incorporation of this cingular area into the basin and in the presence of the small postero-internal outpocketing already mentioned.[1] Paracone and metacone are mere elevations at the ends of the long, nearly straight ectoloph. An external cingulum is present posterior to the paracone, where it forms a stout, rather wide and featureless shelf that passes back into the postero-externally projecting metastylar area; a crest connects metastyle and metacone.

M^2 is quite similar to the corresponding tooth of *Z. paleocena*, differing only in a few points. The tooth is slightly smaller relative to M^1, the postero-internal angle is somewhat more squared, and the antero-external style is rather more prominent and connected by a low inconspicuous crest to the tip of the paracone. The adjacent styles of M^{1-2} abut to form an apex from which the outer margin of the cheek tooth series falls away anteriorly and posteriorly.

The first lower molar differs only in detail from that of *P. silberlingi*. The paraconid is usually higher and slightly more independent and is invariably larger than the metaconid. In several teeth the latter cusp has almost or quite lost its identity in the oblique trigonid crest. Trigonid and talonid are consistently better demarcated externally. The crest that forms the external border of the talonid curves inward at its anterior extremity to reach the center of the posterior face of the trigonid a short distance below the protoconid rather than abutting against the base of the trigonid externally, as is the rule in *P. silberlingi*. A narrow, shallow groove lies between the trigonid face and the incurving position of the crest. The main portion of the talonid crest, that forming the lateral and posterior borders of the basin, appears to be more cuspidate than in the Lebo sample; the cuspules number from four to nine rather than from two to three. The two cuspules on the lingual side of the talonid are extremely variable in the Shotgun sample, amounting in some specimens to little more than irregularities on the talonid margin. An interradicular crest is present. M_2 resembles the corresponding tooth of *P. silberlingi* more closely than does M_1; Simpson's description (1937, p. 138) applies practically verbatim to our single specimen.

[1] The posterior cingulum of M^1 of *Zanycteris paleocena* is not as distinct from the dentral basin as Simpson's figure (1935, fig. 6) would suggest.

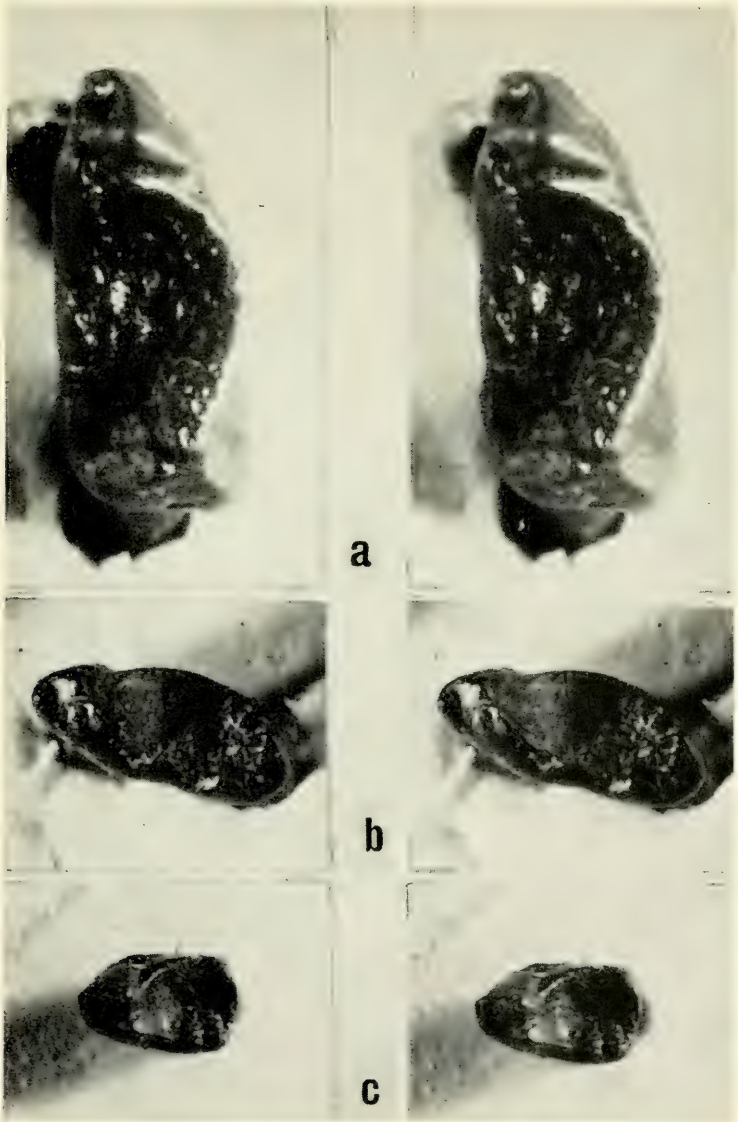

FIG. 2. *Picrodus* sp. cf. *P. silberlingi* Douglass. *a*, U.W. no. 1781, RM_1, approximately X 20. *b*, M.C.Z. no. 8422, RM_1, approximately X 11. *c*, M.C.Z. no. 8423, RM_2, approximately X 11. Stereoscopic views.

In both upper and lower molars, the enamel at the base of the crown extends out far beyond the necks of the teeth, the external and posterior cingula of M^1 and the postero-external portion of the talonid of M_1 being especially projecting. The term exoedaenodont has been applied to this condition, which, in the Insectivora, is encountered especially among the Dimylidae (Hürzeler, 1944). Hürzeler and also Saban (1958, p. 896 n) believe that exoedaenodonty is an indication of a malacophagous diet, Saban citing in support the numerous shells of *Anodonta* that occur in deposits that yield remains of Dimylinae. However this may be for dimylids with their strongly cusped molars, we do not believe that it indicates any such habit for the pierodontids.[1] As Matthew recognized in his description of *Zanycteris*, low crowned more or less flattened molars with finely wrinkled enamel of the sort that occur in the family almost certainly indicate a frugivorous diet.

The small fragments of maxillae and mandibles add nothing to knowledge except to suggest that the anterior root of the zygoma may not have been as stout as in *Zanycteris*.

MEASUREMENTS IN MM.

	U. W. 1780	M.C.Z. 8363
Length M^1	2.85	2.95
Width M^1	2.35	2.40
Length M^2	1.35	—
Width M^2	1.63	—

	N	OR	M	σ	V
Oblique maximum diameter[2] M_1	7	2.40 —2.85	2.66 ±.051	.135 ±.036	5.07 ±1.35
Width talonid M_1	10	1.00 —1.40	1.16 ±.0386	.122 ±.027	10.5 ±2.34

	M.C.Z. 8423
Length M_2	1.90
Width M_2	1.10

[1] Nor, *a fortiori*, for such forms as soricids and various microchiropterans that are exoedaenodont to varying degrees.

[2] As measured by Simpson (1937, p. 138).

DISCUSSION

Matthew, in his description of *Zanycteris paleocena*, took no account of *Picrodus silberlingi*, and indeed there was nothing in Douglass' description and figures to invite comparison between the two forms. It remained for Simpson, with new material of *P. silberlingi* and first-hand knowledge of *Z. paleocena*, to show that they were closely related. As he pointed out (1937, p. 136), the species were distinct, but in the absence of comparable parts it could not certainly be stated that this was also true of the genera. We now have lower molars indistinguishable generically from *Picrodus* found with upper molars clearly distinct from those of *Zanycteris*. On the face of it, then, the two previously described species would appear to belong to distinct genera. However probable, this cannot yet be considered as certain. The highly specialized lower molars may perhaps prove to be rather stereotyped within the family and hence unreliable for generic discrimination. Although quite unlikely, it is thus still conceivable that *P. silberlingi* and *Z. paleocena* may represent one genus, and *P.* sp. another. Finds of associated upper and lower teeth of the previously described forms will be required before all doubt on this score can be set at rest.

As regards the broader question of picrodontid affinites, we are in complete agreement with Simpson (1937) that the family cannot be referred to the Chiroptera. The enlarged lower incisor, small upper canine, small premolars, long and slender muzzle, and origin of the anterior root of the zygoma opposite M^{1-2} are definitely non-chiropteran characters. Since Matthew's work, it has always been stated that the molars resembled those of the specialized Phyllostomatidae, members of the subfamilies Sturnirinae, Phyllonycterinae and Stenoderminae. Thanks to the excellent collection of bats in the Museum of Comparative Zoology, we have been able to make comparisons with nearly all members of these three groups. We are quite unimpressed by the resemblances between their molars and those of the picrodontids. Essentially these are limited to wrinkled enamel and pointed trigonids, and are more than offset by numerous differences.

Sturnira and the Phyllonycterinae have smooth enamel. In *Sturnira*, the upper molars have deep, antero-posteriorly running central valleys and no traces of lophs; the lowers have the trigonid and talonid basins confluent, the metaconid widely separated from the protoconid, and the trigonid of M_1 neither compressed nor elevated. In the phyllonycterines, the upper molars

are triangular and lack lophs and a stylar area; the lowers have the trigonids scarcely elevated above the talonids, and all cusps, save the protoconid of M_1, incorporated in the rims of the talonid basins. The Stenoderminae have wrinkled, often strongly wrinkled, enamel, but the molar structure is very different from that of the picrodontids. The upper molars are short in comparison with their widths, M^2 is large (except in *Pygoderma*), frequently larger than M^1, and the paracones and metacones are high and trenchant (in *Pygoderma* the paracones only), standing well above the flattened lingual portions of the teeth. The trigonids are elevated and compressed to points, but the compression does not involve the whole trigonid as it does in the picrodontids. The metaconid, when not subordinated in the crest running to the apex of the protoconid, is a distinct element situated low on the crown. The pointed protoconids of both molars and premolars give every appearance of being involved in the same morphogenetic gradient.

The few resemblances in molar structure between picrodontids and specialized phyllostomatids seem clearly to be of the sort brought about by convergence. The Microchiroptera can be eliminated as possible relatives of the Picrodontidae, and we can see in the latter nothing suggestive of the Megachiroptera. On the positive side, we can offer no really useful suggestion as to the ordinal affinities of the picrodontids. Simpson has remarked that "reference to the Primates is merely a possibility, with no positive evidence to commend it." The possibility, of course, exists, and such picrodontid characters as the small size of the trigonid compared with that of the talonid and the tight grouping of the trigonid cusps could be cited as resemblances, however vague, to early members of that order. Resemblances of this sort scarcely constitute positive evidence, however. Reference to the Insectivora is equally unsatisfactory. Our queried placement of them there is strictly faute de mieux, due largely to reluctance to use the Primates as a scrap-basket order.

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